SOLAR COLLECTOR FOR HEATING AIR

. BACKROUND AND SUMMARY

Solar collectors for air heating have common elements including a frame with sides and ends, means to support an absorber plate, air channels, inlet and outlet connections, and glazing.

Currently, most collector frames and absorber plates are metallic low carbon steel or aluminum, glazing is single or double glass with sealants or gasketing, all relatively heavy, expensive, and requiring assembly of components not well adapted to high speed processing.

As a result, present solar collectors are costly and not competive with other types of energy..

An abundance of solar data defines solar insolation and absorption (efficiency) for many different 'collector designs, including variables such as different latitiudes, solar seasonal angles, angles of collector tilt, hours of sunshine, etc.

Given so many variables, there were few consumers who understood solar engineering, especially how to calculate collector system economics, and therein resides the economic failure of solar energy for home use. Solar energy is all about abundant energy, how to collect and utilize it, and how to make solar systems and therms of heat output competitive with other sources.

Solar collectors for residential heating are only part of the installed cost but presently represent a significant portion of the expense,

Current practice involves roof or wall mounting of collectors that are fixed and at proper sun angles for only a portion of the solar year.

Since roofs and wall exist, they were the preferred site for installation of panel collector arrays. Given that existing roof / wall areas were already available, other mounting options were not usually considered, nor were they practical due to the size and weight of current collectors.

Collector efficiency was and is considered to be critical to production of heat despite other major limitations imposed by fixed mounting angles etc. and collector designs included costly components for marginal efficiency increases.

With the inventive collectors using lighter materials and making them easy to connect as an array in a framework remote from a building collectors can now be arranged for optimum solar angles and maximum solar colletion per sq. ft. to provide large ares for solar collection and despite the possibilty of lower efficiencies, this invention and solar concepts aim toward greater solar insolation and collection with some potential loss of efficiency.

Together with inexpensive materials produced at speeds over 300 fpm, converted into components and assembled at about 50 panels / min, the inventive panels provide inexpensive supplemental heat at a cost per therm competitive with conventional fuels

The objective of the invention is to provide solar collectors from material abundantly produced, readily converted with known technology requiring less assembly time, for light weight installation in a framework pivotable along one margin to adust to changing solar seasonal angles.

With the above and other objectives in view, more information and understanding of the invention and its use for supplemental heat may be achieved by reference to the detailed description hereinafter

BRIEF DESCRIPTION OF THE DRAWINGS

Fig 1 is a plan view of the instant collector panel illustrating the upfolded end panel with corner folded tabs and side panels to complete the container tray, secondary end panels with air plenums, secondary side panels with plate supports and cutaway portions of the absorber plate. The top cover is shown phantom. Film overwrap not shown.

Fig 2 is a sectional side elevation viewed from line 2-2 of Fig 1 illustrating location of the air plenums and absorber plate with bottom support(s) for longitudinal plate support.

Fig 3 is a sectional end elevation viewed from 3-3 of Fig 1 illustrating side and central plate supports and air plenum slots for air distribution.

Fig 4 is an enlarged partial side elevation similar to Fig 2-2 as viewed from line 4-4 of Fig. 1 illustrating the relationship of absorber, plenum slot apertures, and air space for flow above and below the absorber.

Fig 5 is a partial side elevation of one side support viewed from line 5-5 of Fig. 1 illustrating absorber plate support provided by the secondary side panel and inner folded attachment.

Fig 6 is partial end elevation viewed from line 6-6 of Fig 1 illustrating one central absorber support and alternate folding for more rigidity (phantom).

Fig 7 is a sectional end view along sight line 7-7 of Fig. 1 illustrating use of a common conduit connection between adjacent collector panels

Fig 8 is a plan view of a corrugated material blank comprising the

main bottom panel, connected primary and secondary side and end panels with cutouts, score lines for folding, etc, and an optional third panel extended from a secondary side panel to form a bottom support (only one side shown)

Fig 9 is a sectional side view like Fig 5 iillustrating use of the foilded blank shown in Fig 8. The interrmediate panel is eliminated to form a double thickness container side.

Fig 10 is a sectional end view like Fig. 6 illustrating use of the extended panel in Fig 8 to form the upstanding plate support and resultant double thickness (partial) container bottom.

DETAILED DESCRIPTION

In Fig 1, a solar heat collector panel 1 includes a primary main bottom panel 2, two primary end panels 3, 4, and two primary side panels 5,6 shown assembled as an open container.

Before end panels 3, 4 are folded vertically upward, tabs 3' and 3" are folded along a side fold line (see F1-F1' and F2-F2' in Fig 8) and after the end panels are upfolded to the vertical position, tabs are secured to the respective ends of the side panels 5,6 to complete the container (tray)

In Fig. 2, separately fabricated two-piece secondary end panels 8,9 are placed inside of end panels 3, 4. The surface facing the end panel is secured (preferable adhesive) to the inside of the end panel and the second piece is scored and folded into the shape of plenums 10, 10'.

In Fig 2, absorber plate 7 is supported by at least one longitudinally oriented vertical support 16 under the central portion of the plate. The absorber plate is bonded to the top of the support.

Plate support 16 is the upraised portion of the two-piece secondary bottom panel 15 secured to the primary bottom panel 2.(see Fig 6 detail)

In Fig 2, an outward fold line F 5 on a secondary side panel is behind the vertical support 16 and is shown in phantom. Other adjacent score / fold lines S, S' are seen in Fig. 8. (see also Fig 5).

In Figs 1,2, 3 the collector has a top cover or is wrapped in film to eliminate leakage and windage effects, but film is not shown for clarity (see film portions in Fig 7 at the inlet and outlet end connections)

In Figs 3 and 5, projections 13,14 on the inside portion of two part secondary side panels 11, 12 support the plate at the sides. Score lines and fold lines for these projections are also shown in Fig. 8 inside the extended side panels P 2 of Fig 8.

In Fig. 3, vertical air distribution slots 21 are arranged symmetrically about the panel centerline and can be positioned or altered for most efficient air flow above and below the absorber and transversely across the inside of the panel.

Fig 4 is enlarged for clarity and the description for Fig 2 applies for the right hand end plenum shown. Reference to slots 21 is noted.

Fig. 5 is enlarged for clarity of details shown in Fig. 3 and as described above in Fig 3. For clarity, the primary bottom (2) and side panels (5) are shown in phantom to more clearly show the two part secondary panel 11 which forms the side projection 13.

Fig. 6 is enlarged from Fig 3 and is described above. In Fig 6 flat bottom panel 2 is in phantom to more clearly show the two part secondary bottom panel 15 bonded together to form a vertical absorber plate support 16 . For rigidity, another embodiment includes a triangular space between upstanding portions 16.

In Fig 7, two collector panels C1, C2 are overwapped in film for weatherproofing . In panel C1, a common conduit connector 22 is inserted thru punctured film 23, 23' , extends outward from aperture 19 and is inserted through punctured film 24, 24' , through (inlet/outlet) aperture 20 of an adjacent panel C2. a gasket with "O" rings seals minute spaces between the film and connector to prevent water leakage to the inside.

In the foregoing description, primary and two-part secondary panels form end and sides three panels thick for maximum insulation with only corrugated material. This is preferred but involves separate fabrication of the secondary inserts.

In Fig 8, secondary panels P2 are shown as extensions if primary panels P1 and are conected thereto at fold lines F-1, F-2, -3 and F-4. Reference numbers used for 3-part panels heretofore described are the same except for their elimination in the embodiment shown in Fig. 8.

The blank fabricated in Fig. 8 provides the same functions as above, but it is understood that when folded, one part of the secondary panel described above is no longer used and the inner part is folded into side supports or end panel air plenums.

In another embodiment, a tertiary panel P3 is extended from side panel P2 to provide a second thickness of corrugated on the bottom panel and one vertical absorber support 16 extending upward from the bottom. This arrangement applies to both sides having tertiary panels If necessary (Fig 8 only shows one tertiary extension for clarity).

In Fig 9, the first panel P1 forms the side and panel P2 the inside panel with projection side supports.

In Fig 10, first panel P1 forms the bottom and the tertiary panel P3 is folded over the side, on the bottom and includes vertical plate support 16 as a folded part of panel P3.

It is understood that the present invention may be embodied in other specific forms without departing from the spirit or special attributes hereof, and it is, therefore, desired that the present embodiments be considered in all aspects as illustrative and therfore not restrictive, reference being made to the foregoing description to indicate the scope of the invention.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent are the following: